Advanced Multi-Spectral Sensor & Subsystem Test Capabilities (AMSSTC)

PM ITTS STOC Industry Conference

7 - 8 August 2001

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RTTC

Background

- T&E strategy is to reduce the number of field tests, thus reducing cost
  - Lab testing of subsystems and components has proven to be cost effective
  - Modeling and simulation allows weapon developers, testers, and evaluators to work in a virtual environment
  - Proper use of modeling and simulation will result in fewer required flight tests and other field exercises

- AMSSTC will expand current subsystem test capabilities and develop new capabilities through the use of modeling & simulation tools

Overview

- **A Multi-Spectral test capability will be developed to test seeker and AUR level MMW/IR/Laser Sensors in a HWIL environment**
- **Virtual Range currently replicates IR and visible spectrums, AMSSTC will add the MMW spectrum**
- **Distributed testing of subsystems will be enhanced to link the AMSSTC capabilities, existing RTTC capabilities, and other agency capabilities**
- **Electro-Optics subsystem testing will be enhanced for LWIR, MWIR, Visible, and ELRF applications**
- **Dynamic combined environmental effects testing will be developed with links to subsystem HWIL capabilities**

Acquisition/Contracting

Strategy

- Multiple awards via task orders
- Most elements will be integrated by RTTC
- Most elements are medium to low risk, non-developmental items
- Development: FY02-07, Operation: FY05-FY26

Issues

- No known open issues

AMSSTC Team

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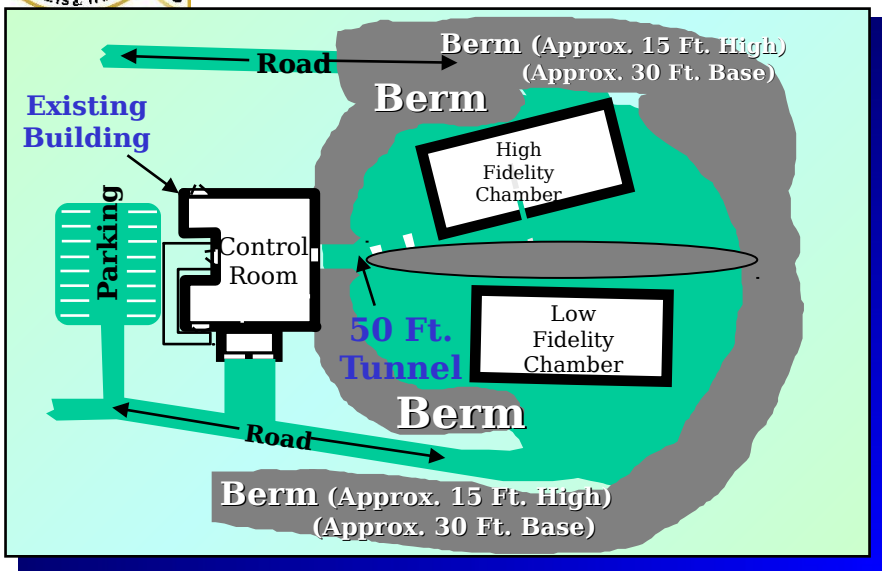
AMSSTC - Element I
Multi-Spectral Missile Life Cycle Test Capability



CUSTOMER/ USERS

- Customer -
  - Redstone Technical Test Center (RTTC)
- Users -
  - Common Missile
  - TOW Fire-and-Forget Missile
  - Tank Extended Range Munition - KE

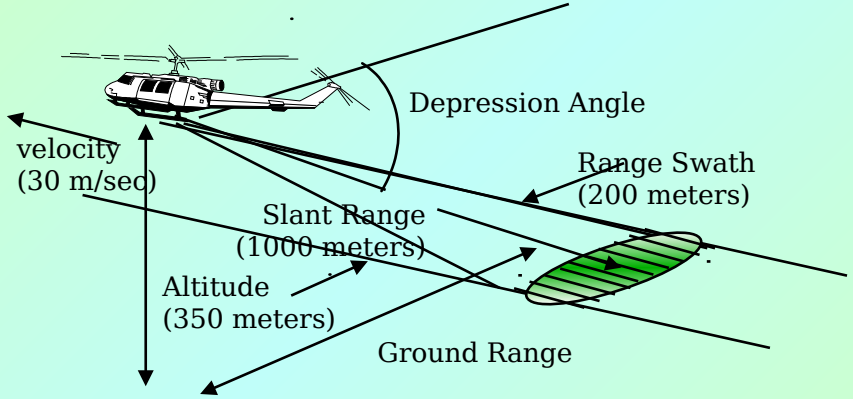
DESCRIPTION

- Fully simulates missile flight performance on "live" multi-sensor guided missiles.
- Provides a high fidelity, closed loop test/simulation capability for single or multi-sensor guided missile systems employing imaging IR, MMW, and/or laser guidance systems.
- Also provides a "cradle to grave" test capability.
- Types of testing include: development, systems integration, reliability, product improvement, and production.

FUNCTIONAL DATA

- Capability for testing MMW, Infrared, Visible, and Laser missile systems.
- Capability to perform nondestructive missile testing and conduct simultaneous tests of missile subsystems in a real-time environment and under operational conditions.
- FY02-06

AMSSTC - Element II
MMW Range Characterization/Virtual Range Development



CUSTOMER/ USERS

- Customer -
  - Redstone Technical Test Center (RTTC)
- Users -
  - Common Missile
  - Tank Extended Range Munition - KE
  - AMCOM RDEC

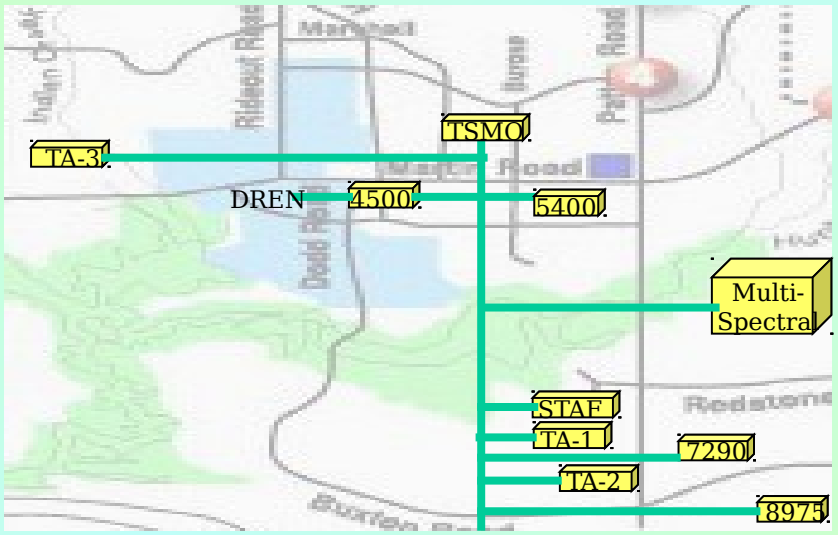
DESCRIPTION

- Provides a core characterization asset capable of being helicopter or tower mounted
- Modular design includes Ka and W MMW bands (microwave bands inherent)
- Leverages existing RTTC helicopter stabilized platform to form a Synthetic Aperture Radar (SAR) capability
- Provides a MMW captive carry test bed
- Types of testing include: Virtual Range development, background and threat signature measurement

FUNCTIONAL DATA

- Capability for developing Millimeter Wave representation of test ranges
- Provides detailed MMW Virtual Range Database (background and clutter)
- Provides threat signature measurement capability
- FY05-07

AMSSTC - Element III
Distributed Testing/Networking/Data Transfer



CUSTOMER/ USERS

- Customer -
  - Redstone Technical Test Center (RTTC)
- Users -
  - Common Missile
  - TOW Fire and Forget Missile
  - Tank Extended Range Munition - KE

DESCRIPTION

- Provides a distributed test command and control capability
- Provides fiber optic network expansion to provide distributed subsystem test capability

FUNCTIONAL DATA

- This capability will provide an organized command and control capability for distributed exercises involving multi-spectral capability, STAF, EOSFEL, EOTASEL, HPC, test ranges, laboratories, and environmental facilities
- Provide fiber optic infrastructure to link multi-spectral capability with existing RTTC assets; data transfer equipment for existing subsystem test capabilities
- FY05-07

AMSSTC - Element IV
Electro-Optics Sensor Laboratory Testing

CUSTOMER/ USERS

- Customer -
  - Redstone Technical Test Center (RTTC)
- Users -
  - Common Missile
  - TOW Fire and Forget Missile
  - Tank Extended Range Munition - KE
  - Improved Target Acquisition System
  - Unmanned Ground Vehicle

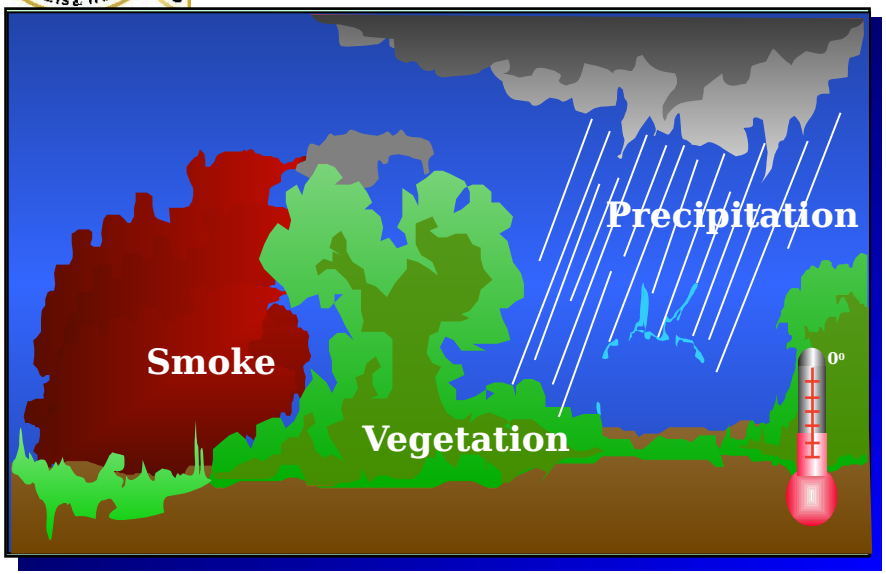
DESCRIPTION

- Adds numerous upgrades to existing electro-optics sensor laboratory testing capability
- Adds visible and mid-wave infrared channels to the Dynamic Infrared Scene Projector (DIRSP)
- Adds Eyesafe Laser Rangefinder (ELRF) capability to DIRSP to support testing target acquisition subsystems that contain ELRFs.
- Adds programmable electronic interface to DIRSP to allow for real-time atmospheric and sensor effects.

FUNCTIONAL DATA

- Adds robustness to Dynamic Infrared Scene Projector (DIRSP) by adding visible and mid-wave channels and ELRF capability to test infrared target acquisition systems and missile seekers
- Adds capability to include real-time atmospheric effects to hardware-in-the-loop simulations
- FY02: FY05-06

AMSSTC - Element V
Environmental Testing



CUSTOMER/ USERS

- Customer -
  - Redstone Technical Test Center (RTTC)
- Users -
  - Common Missile
  - TOW Fire and Forget Missile
  - Tank Extended Range Munition - KE

DESCRIPTION

- Dynamic combined environmental test chamber capable of producing multiple environments (temperature, humidity, rain, etc)
- Inclusion of environmental effects into real-time hardware-in-the-loop capabilities (such as multi-spectral)
- Collection of performance data during environmental effects (including E3) and incorporation into hardware-in-the-loop capabilities
- Incorporate dirty battlefield conditions into hardware-in-the-loop testing

FUNCTIONAL DATA

- Capability for testing MMW, infrared, visible, and laser missile systems under realistic combined environmental conditions.
- Incorporation of perturbation data collected during environmental testing and incorporation into hardware-in-the-loop test capabilities
- FY05-07

Critical Technical & Operational Goals

Element 1

- Must accommodate all-up-round with explosives
- Must simultaneously project MMW(Ka or W), IR, and laser
- Must feature at least two explosive bays capable of simultaneous operations

Element 2

- Must be airborne and tower capable
- All instrumentation mounted inside the aircraft must fit inside 3 each, 19”W x 60” H racks

Critical Technical & Operational Goals

Element 3

- **Must be compatible with existing RTTC infrastructure:**
  - **Hybrid Fiber Optic Network**
  - **Single- and Multi-Mode**
  - **ATM (currently up to OC-12) and Gigabit-ethernet**
- **Must be compatible with Defense Research and Engineering (DREN) protocols**

Critical Technical & Operational Goals

Element 4

- **DIRSP Visible/NIR Channel - Addition to DIRSP for dynamic, in-band visible and Near-IR scene projection capability. Separate optics, sources, mounting hardware and support electronics**
- **ELRF Closed Loop Integration - Integrate closed-loop capability for HWIL testing of eye-safe laser rangefinders. Detect laser pulse, provide delay and respond with appropriate return pulse into receiver**
- **Digital Signal Injection - Provide real-time simulation of EO imaging sensor and atmospheric effects for direct digital injection into fire control or missile guidance electronics**
- **MWIR Channel for DIRSP - Upgrade to DIRSP for testing MWIR FLIRs (3-5 microns). Modify existing DIRSP optics (LWIR) to allow simultaneous LWIR and MWIR projection or provide interchangeable optics to select between MWIR/LWIR**

Critical Technical & Operational Goals

Element 4 (Continued)

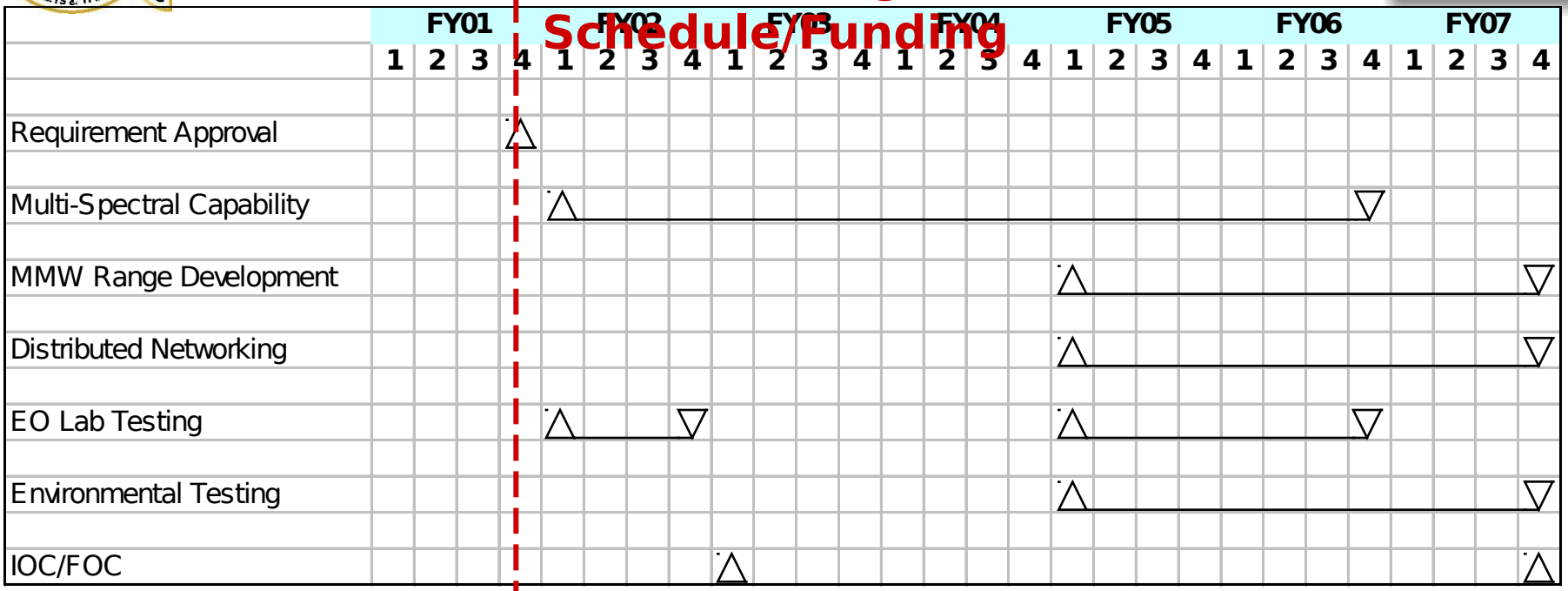
- **IRSP Stimulator Upgrade - Increase spatial and thermal resolution of RTTC DEGA and WISP IRSPs. Larger emitter array formats of 1024x1024, and associated support equipment/packaging/electronics are required. Improved radiometric calibration capabilities in LWIR and MWIR spectrums required**

Critical Technical & Operational Goals

Element 5

- Must be capable of producing combined natural enviroments to replicate desert, arctic, tropic or temperate climates
  - High/Low Temperature
  - Humidity
  - Solar Radiation
  - Low Pressure
  - Rain
  - Icing
  - Sand and Dust
- Must also be capable of producing man-made environments
  - Smoke
  - Chaff
  - Fog Oil
- Must be compatible with existing RTTC IRSPs
- This will be upgrade to an existing facility

AMSSTC Master Program Schedule/Funding



Dollars in Thousands	Prior	2001	2002	2003	2004	2005	2006	2007	Complete
TOTAL Required	0	$	$$	$$	$$$$	$$$$	$$$$		$$$$
RDTE Funded (D984)	0	0	$$	$$	$$$$	$$$$	$$$$		
RDTE Funded (PEO TM)	0	$	0	0	0	0	0		
Total Unfunded	0	0	0	0	0	0	0		
Quantities	0	0	0	0	0	0	0	1	1

SUMMARY

- **FY02 major instrumentation new start**
- **Maximum utilization of competitive procurements for system components**
- **AMSSTC will provide the T&E community with enhanced subsystem test capabilities**

Back-up

Acronyms

AMSSTC	Advanced Multi-Spectral Sensor Stimulation Test Capabilities
APAI	Advanced Planning Acquisition Info
AUR	All-Up-Round
DEGA	DIRSP Engineering Grade Array
DIRSP	Dynamic Infrared Scene Projector
DREN	Defense Research and Engineering Network
ELRF	Eyesafe Laser Rangefinder
EO	Electro-Optical
EOSFEL	Electro-Optical System Flight Evaluation Laboratory
EOTASEL	Electro-Optical Target Acquisition System Evaluation Lab
FLIR	Forward Looking Infrared
HPC	High Performance Computer
HWIL	Hardware-In-The-loop
IR	Infrared
LWIR	Long-Wave Infrared
MMW	Millimeter Wave
MWIR	Mid-Wave Infrared
RTTC	Redstone Technical Test Center
SAR	Synthetic Aperture Radar
STAF	Simulation/Test Acceptance Facility
STOC	STRICOM Omnibus Contract
WISP	Wide-band Infrared Scene Projector

DIRSP
DYNAMIC INFRARED SCENE PROJECTOR

CUSTOMER / USERS

Customer - Redstone Technical Test Center (RTTC)

Users -

- **COMANCHE (RAH-66), APACHE -LONGBOW**
- **ITAS, IBAS, JAVELIN, AVENGER, TOW- FIRE & FORGET, UGV**
- **Future Combat Systems**
- **Horizontal technology integration 2ND GEN FLIR Platforms: M2/M3-A3 IBAS, LRAS3, LOSAT**

DESCRIPTION

- **Provides enhanced modeling, simulation, and test capability for evaluating Electro-Optic (EO) sensors and InfraRed (IR) imaging subsystems.**
- **Enables projection of *accurate, dynamic*, and *realistic* IR scenes into the entrance aperture of the sensor/subsystem under test.**
- **Provides *repeatable, controlled, complex, real time* scenarios with *multiple targets, clutter* and *countermeasures*, while exposed to extreme temperature environments across the system's operational envelope.**
- **Provides assessment in *reconnaissance, surveillance, and target acquisition, for testing, training, and doctrine evaluation;* to include aided or automatic target queuing, tracking and ATR performance.**
- **Sensors are tested in a closed-loop simulation at the subsystem level and in various system operational environmental conditions.**

FUNCTIONAL DATA

- **Spectral Band: Long Wave Infrared (LWIR) 8-12 um**
- **Frame Rate: 30 hertz**
- **IOC and Final Acceptance Testing at RTTC: 4Q FY0**